

Research Report in IB Sciences

Quick Check List

Exploration & Personal Engagement

Introduction

Introduction & Personal Engagement

- The topic/phenomenon/situation being studied is introduced and discussed and the research question in general is introduced
- Personal Engagement with the investigation is demonstrated through:
 - independent thinking, initiative or creativity
 - personal significance, interest or curiosity
- Justification is given for choosing the RQ.
 - Any special processes being studied are described and discussed, if appropriate

Research Question

- Research Question is clearly and precisely stated
- Independent and dependent variables are specifically identified
- **Several** controlled factors are identified

Background Theory

- Relevant information/theory is introduced and used to place the RQ within the scientific context
- Predicted results are stated and explained, based on the background information/theory/equations
- Authoritative sources from which you get any background information/theory are cited

Methods

Procedure

- Equipment set-up is clearly explained. Labeled diagram is included, where appropriate
- Each quantity that must be measured, how it was measured, how it was varied, and how many different points taken/what range covered is described
- Important factors/quantities that must be controlled in the set-up and procedure are identified.
 - Techniques used to control each are described
- Appropriate measurement techniques have been selected
- Data collected relates directly to the Research Question
- Range of values of the independent variable to be tested is stated
 - A sufficient range of the independent variable is tested
 - An appropriate number of trials are carried out

Safety, Ethical & Environmental Concerns

- Safety, Ethical & Environmental concerns have been clearly identified, as appropriate
- The method for addressing all identified concerns has been clearly described

Analysis

Data

- Quantitative data, including uncertainties, is presented fully and appropriately
 - Correct units and uncertainties are given for all data.
 - All raw data is recorded to the correct level of precision (correct number of significant figures)
 - An appropriate format has been used to display the raw data
 - Table has a meaningful title and column headings that allow for easy interpretation of data
 - Units and Uncertainties are given with column headings
 - Table captions should explain how the uncertainty values were derived (if you don't do so elsewhere)
- Qualitative data is presented fully and appropriately (if necessary)

Data Processing

- All manipulation and processing of data needed is clearly shown, including:
 - Data are processed using an appropriate technique/type of calculation
 - Calculations are done correctly (including units and uncertainties)
 - Calculations are to the correct level of precision
 - Uncertainty rounded to 1 sigfig (where appropriate)
 - Data rounded to decimal place where uncertainty starts
 - Sample calculations are shown for **every** type of calculation carried out
 - Samples of all uncertainty calculations performed are shown
 - Sample graphs showing how data were obtained from computer-generated graphs are shown, if appropriate
 - Percent Error calculated, where appropriate

Results & Interpretation

- Processed data results are presented appropriately (graph, table, figure...)
 - An appropriate format is selected to display processed data and to show patterns and relationships
 - Titles, labels and captions are included, as appropriate
 - Presented results directly answer the RQ
 - Percent Error calculated where appropriate
- If presented in a graph, results show a clear trend:
 - Uncertainty bars are included
 - Curve-fit used correctly describes the trend, where appropriate
 - Graph axes are manipulated ($1/x$, x^2 , etc) to obtain a straight line graph, where appropriate
 - Graph showing uncertainty in slopes and intercepts is shown, where appropriate
 - Equation derived from graph is presented with uncertainties, as appropriate
- Results are interpreted to enable a conclusion addressing the RQ
 - Meaning of final results/equation is fully discussed

Evaluation

Conclusion

- Results are clearly stated and discussed
- Conclusion directly answers the RQ
- An equation(s), with uncertainties, relating the variables is shown, where appropriate
- Trends and patterns are identified/ compared and explained
- Conclusion is justified by using several data points to show that the conclusion is supported by data
- Experimental values are compared to literature values, where appropriate
- Any literature consulted is correctly referenced
- Levels of confidence in the conclusions is discussed with reference to:
 - relative size of uncertainty in the data
 - quality of curve fit to the data, where appropriate
 - agreement with theory, where appropriate
- The range and situation to which the conclusions may be applied is noted, where appropriate

Evaluation

- Strengths of the investigation (1-2 of most important) are discussed
- Specific weaknesses (about 4) in the design and conduct of the experiment (processes, techniques, equipment, etc) are identified
 - At least one methodological issue (limitation of range sampled, issues with experimental design, etc) is identified
 - Several procedural issues (errors in variables' or controlled factors' measurements) are identified
- The effect of each identified weakness on the results is discussed (random or systematic, and if systematic, which direction it will skew your results, if appropriate)
- Specific suggestions to improve/avoid each identified weakness are given (including modifications to experimental techniques)
- Suggestions may include how to reduce random error, remove systematic error, and obtain greater control of variables
- Suggestions are realistic and specific
- Suggestions for further research are given

Communication

Writing and Presentation

- Language is concise, clear, familiar, and precise
- Name and date, Title, Subtitles, included
- Font and style consistent throughout the report for section headings, subheadings, and text
- Tables/Figures/Graphs & Captions not split across pages
- Report is well structured and clear
- Report is **no more than 12 pages long**

Proofread your report aloud!

It's the best way to catch mistakes in your own writing.